UNITED STATES DISTRICT COURT
DISTRICT OF MASSACHUSETTS

SINGULAR COMPUTING LLC, Plaintiff, v. GOOGLE LLC, Defendant.	Civil Action No. 1:19-cv-12551-FDS Hon. F. Dennis Saylor IV

PLAINTIFF'S MOTION IN LIMINE NO. 4:
TO PRECLUDE GOOGLE FROM ARGUING INVALIDITY BASED ON VFLOAT, ALONE OR IN COMBINATION WITH OTHER REFERENCES

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Plaintiff, Singular Computing LLC ("Singular"), respectfully submits this motion *in limine* to preclude Google from arguing invalidity based on the VFLOAT system, alone or in combination with other references.

I. INTRODUCTION

Google's expert witness on the issue of invalidity, Dr. Miriam Leeser, opines that the asserted claims are anticipated and obvious based on alleged public knowledge and/or use of what she calls "the VFLOAT system," alone and in combination with other references. *See* Exhibit A (Leeser Rpt.) ¶¶ 19-20. However, Google has provided no evidence to support a finding that this constitutes prior art. As such, Dr. Leeser's testimony regarding VFLOAT is not relevant and should be excluded.

The "VFLOAT system" is a circuit configuration that was created and allegedly placed on a reconfigurable chip by Dr. Leeser and her student, Pavle Belanović, during an experiment conducted in a laboratory at Northeastern University in early 2002. *See generally* Exhibit A ¶¶ 110-123. The parties do not dispute that "the VFLOAT system" existed only for a brief time period while this experiment was being conducted. Google has provided no evidence identifying exactly when this system existed, and has not shown that it was accessible to the public at any point during its existence. It was not demonstrated, described, disclosed, or otherwise made known to the public until Mr. Belanović presented his master's thesis several months after the experiment had concluded, by which time the "VFLOAT system" itself had ceased to exist.

It is well-settled law that invalidity based on 35 U.S.C. § 102 requires "knowledge or use *which is accessible to the public*." *See BASF Corp. v. SNF Holding Co.*, 955 F.3d 958, 963-964 (Fed. Cir. 2020) (emphasis added). As the court in *BASF* explained, "[p]rior knowledge or use that is not accessible to the public upon reasonable inquiry, confers no benefit on the public, and thus does not suffice as a defense under § 102(a)." *See BASF* 955 F.3d at 965 (internal citations

omitted). Further, under § 102, any "public use" must be sufficient to enable one with ordinary skill in the art to practice the invention. *See in re Borst*, 345 F.2d 851, 855 (1965). The defendant bears the burden of establishing, by clear and convincing evidence, that prior knowledge or use of a system satisfies these requirements. *See Microsoft Corp. v. i4i Ltd. P'ship*, 131 S. Ct. 2238, 2239 (2011). Whether a reference qualifies as prior art under § 102 is a question of law. *See In re Klopfenstein*, 380 F. 3d 1345, 1347-8 (Fed. Cir. 2004); *see also In re Hall*, 781 F.2d 897, 899 (Fed. Cir. 1986) ("The § 102 publication bar is a legal determination based on underlying issues of fact.")

Google has failed to meet its burden. An experimental system that exists only briefly in a closed laboratory, the existence of which is first disclosed to the public months after its destruction, is not "publicly" known or used under § 102. Google does not allege or provide evidence that any member of the public was present in the laboratory while Dr. Leeser's experiment was being performed. Indeed, even if members of the public had inadvertently wandered into Dr. Leeser's laboratory at the precise moment when the alleged "VFLOAT system" existed, they would have seen only a featureless computer like any other, without any hint as to the system's structure or operation. The "VFLOAT system" thus conferred no benefit to the public, and under the logic of *BASF*, was not publicly known or used under § 102.

Google improperly relies on Mr. Belanović's thesis to supply missing evidence of public use. *See* Exhibit A ¶ 122, fn 90. As an initial matter, under this Court's own prior rulings, Google is estopped from relying on the Belanović thesis by the IPR estoppel doctrine, because Google was aware of the Belanović thesis and its contents when it filed its IPR petitions against the patents-in-suit. *See* Dkt. 447 (Order on IPR Estoppel) ("Google is estopped from using patents and printed publications of which it was aware, or reasonably should have been aware, at the

time of the IPR proceeding"); *see also* Exhibit B (Google's Preliminary Invalidity Contentions) at p. 6.

Further, the fact that the Belanović thesis itself is a publication does not mean that the experiment it describes was public. Allowing Google to argue that a scientific experiment is public based solely on the fact that it was later described in a scientific publication would defy logic, and would blur the line between scientific *papers*, which are often made available to the public, and scientific *experiments*, which seldom are. Indeed, the IPR estoppel doctrine itself rests on the distinction between printed publications like the Belanović thesis, and the systems – such as the "VFLOAT system" – that they describe.

Without the Belanović thesis, Google is left with only Dr. Leeser's account of a system that existed in a closed laboratory for a brief, unspecified period of time. Thus, Google has failed to carry its burden to show that the "VFLOAT system" was publicly known or used as required by § 102; it should be precluded from arguing invalidity based on VFLOAT, alone or in combination with other references.

II. ARGUMENT

A. The "VFLOAT System" is a circuit configuration that existed only briefly during a 2002 experiment in a Northeastern laboratory

As explained above, the "VFLOAT system" is an experimental circuit configuration that was created using a tool called "VFLOAT" and allegedly placed temporarily on a reconfigurable chip by Dr. Leeser and her student, Pavle Belanović, in a laboratory at Northeastern University in early 2002. *See generally* Exhibit A ¶¶ 110-123; *see also* Exhibit C (Leeser Deposition Tr.) at 54:17-55:22.

Dr. Leeser's experiment was intended to determine how many of various types of circuits could fit within a particular reconfigurable chip. *See id.* Dr. Leeser and her student performed

this experiment using a reconfigurable chip called a Field Programmable Gate Array (FPGA) on a commercially available circuit board attached to a host computer. *See* Exhibit A ¶¶ 111-114.

The circuits involved in Dr. Leeser's experiment were designed to perform arithmetic operations using a variety of numerical formats. In particular, Dr. Leeser and her student Mr. Belanović identified fifteen different floating-point formats, created adder and multiplier circuits for each of these formats, and estimated how many of each could realistically be placed on a single chip. *See* Exhibit A ¶¶ 117-123; *see also* Exhibit D (Belanović Thesis), p. 46, Table 2.2. As part of this process, Mr. Belanović, under Dr. Leeser's direction, allegedly placed 61 multipliers for the "C2" numerical format on an FPGA chip, as shown in the table below:

Table 2.2: Operator synthesis results

Format	**Bitwidth**			**Area**		**Per IC**	
	total	exponent	fraction	fp_add	fp_mul	fp_add	fp_mul
A0	8	2	5	39	46	236	200
A1	8	3	4	39	51	236	180
A2	8	4	3	32	36	288	256
B0	12	3	8	84	127	109	72
B1	12	4	7	80	140	115	65
B2	12	5	6	81	108	113	85
C0	16	4	11	121	208	76	44
C1	16	5	10	141	178	65	51
C2	16	6	9	113	150	81	61
D0	24	6	17	221	421	41	21
D1	24	8	15	216	431	42	21
D2	24	10	13	217	275	42	33
E0	32	5	26	328	766	28	12
E1	32	8	23	291	674	31	13
E2	32	11	20	284	536	32	17

Belanović Thesis, Table 2.2

The number "61," outlined in red in the table above, represents the FPGA chip configured to include 61 "C2" multipliers. *See id.* This configuration, which corresponds to the "VFLOAT system," is one of 30 different configurations allegedly tested in the course of Dr. Leeser's experiment (shown generally in the rightmost two columns of the table above). *See id.*; *see also* Exhibit A ¶¶ 121-122. Dr. Leeser does not allege invalidity based on any of the other 29

configurations; the FPGA configured with 61 C2 multipliers is the *only* physical device or system that Dr. Leeser identifies as "the VFLOAT system." *See id.*

As Dr. Leeser explains, each of these 30 configurations was separately tested using the same reconfigurable FPGA chip. *See id.* ¶¶ 111-123. This means that the configuration with 61 C2 multipliers – *i.e.*, the "VFLOAT system" upon which Google's invalidity arguments are based – would have existed only briefly before being replaced with one of the other 29 experimental configurations shown in the table above. *See id.*.

The parties do not dispute that the "VFLOAT system" includes only this one experimental configuration containing 61 "C2" multipliers. It is the only circuit configuration that Dr. Leeser identifies in her report as relevant prior art, and the only circuit configuration that she was able to identify at her deposition as the basis for her invalidity opinions. *See id.* ¶¶ 121-123; *see also* Exhibit C at 44:19-54:15.

B. The "VFLOAT system" was not publicly known or used

The only evidence that Google provides to support its assertion that the "VFLOAT system" was publicly known or used is Dr. Leeser's statement that "The [Rapid Prototyping Laboratory] itself, where our physical workstation described above was located, was a shared space in which, at any given time, at least a dozen and possibly as many as 20 other students and faculty members within the Department of Electrical and Computer Engineering routinely worked and to which they had unrestricted access." Exhibit A ¶ 129.

The fact that an experiment was performed in a laboratory where other people work, and to which "possibly as many as 20" people had access, does not mean that it was public. The same could be said of virtually any functioning laboratory. Indeed, Dr. Leeser admits that her laboratory was accessible only to a select few members of her own science department at Northeastern University. *See id.* It was not accessible to the Northeastern University community

at large, let alone the general public. *See id.* Further, Google has provided no evidence whatsoever that anyone apart from Dr. Leeser and Mr. Belanović was actually present in the laboratory during the experiment described above.

Google also fails to explain how access to Dr. Leeser's laboratory is relevant to whether the "VFLOAT system" was itself publicly known or used. The experiment described above was performed on a reconfigurable chip attached to a "standard Intel-based, x86 host workstation." *Id.* ¶ 114. In particular, the reconfigurable chip was attached to a circuit board, shown at ¶ 112 of Dr. Leeser's Report, that was attached to the host CPU using a standard, "PCI" interface, contained within the workstation's outer casing. *See id*. ¶ 112. In other words, the experiment was performed on a computer that looked pretty much like every other computer, using a chip whose operation would not have been readily apparent to any member of the public, even if present, and that would have been entirely invisible to a casual observer who may have been in the laboratory at the time.

The "VFLOAT system" was therefore "not accessible to the public upon reasonable inquiry, and confer[red] no benefit on the public." *BASF*, 955 F.3d at 965. Nor would mere public access have provided enough information to one of ordinary skill in the art to replicate the "VFLOAT system," and Google has failed to carry its burden in showing otherwise. *See in re Borst*, 345 F.2d at 855; *see also Microsoft*, 131 S. Ct. at 2239, 2242. As a result, following the reasoning in the *BASF* case, the "VFLOAT system" was not publicly known or used as required by § 102. *See BASF*, 955 F.3d at 965.

C. Google improperly attempts to conflate the "VFLOAT system" with Dr. Leeser's work in general

The "VFLOAT system" derives its name from the fact that Dr. Leeser and her student built it using a software tool called VFLOAT. This VFLOAT tool, which was also built by Dr.

Leeser along with several of her graduate students, provided a set of arithmetic circuits that could be chained together in various ways to perform complex arithmetic tasks using a variety of number formats. *See* Exhibit A ¶¶ 74-109. Much of Dr. Leeser's work during the relevant time period involved the development and use of the VFLOAT tool. *See generally id*. § VI. In particular, the VFLOAT tool was used to build circuits for "various different applications." Exhibit C at 13:24-25; *see also generally* Exhibit A § VI.

The "VFLOAT system" and the VFLOAT tool are entirely different things. The "VFLOAT system" as explained above, is a particular configuration of an FPGA chip that included 61 "C2" multipliers. The VFLOAT tool, by contrast, is a piece of software that was used as a tool to *build* the "VFLOAT system."

When it comes to showing public use, Google attempts to conflate the "VFLOAT system" with the VFLOAT tool by referring to both using the ambiguous term "VFLOAT." For example, § VI.E of Dr. Leeser's report is titled "Public Disclosures Relating to *VFLOAT* and Our System Setup." Exhibit A § VI.E (emphasis added). In this section, Dr. Leeser explains how various members of the "Northeastern University community also learned of and became familiar with VFLOAT," how she presented tips for "implementing VFLOAT" at a conference in 2002, and how she further developed "VFLOAT" at Los Alamos National Laboratory. *See id.*, §§ VI.E.2-5. However, all of these disclosures relate exclusively to the VFLOAT *tool* and are entirely irrelevant to the "VFLOAT system." *See id.*

It does not matter whether the VFLOAT tool was publicly known or used. What matters is whether the so-called "VFLOAT system" was publicly known or used; as explained above, it was not.

III. CONCLUSION

For the reasons given above, Google should be precluded from arguing invalidity based on the VFLOAT system, alone or in combination with other references.

Dated: December 5, 2023

Respectfully submitted,

/s/ Kevin Gannon

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LOCAL RULE 7.1 CERTIFICATION

I, Kevin Gannon, counsel for Singular Computing LLC, hereby certify that I conferred with counsel for Google LLC to resolve the issues presented in this motion but, after a good faith attempt to reach agreement, the parties were unable to do so.

/s/ Kevin Gannon

CERTIFICATE OF SERVICE

I certify that, on December 5, 2023, all counsel of record who have consented to electronic service are being served with a copy of this document via the Court's CM/ECF system.

/s/ Kevin Gannon